

SOUTH PENN OIL COMPANY,
O.M. MEAD LEASE
Allegheny National Forest Oil
Heritage ~~Recording Project~~
Morrison Run Field
Clatsdon Vicinity
Warren County
Pennsylvania

HAER No. PA-438

HAER
PA
62-CLAR.V,
1-

PHOTOGRAPHS

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
1849 C Street, NW
Washington, DC 20240

ADDENDUM TO:
SOUTH PENN OIL COMPANY, G. M. MEAD LOT 492 LEASE
Morrison Run Field
Clarendon vicinity
Warren County
Pennsylvania

HAER PA-438
PA,62-CLAR.V,1-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD
ADDENDUM TO
SOUTH PENN OIL COMPANY, G.M. MEAD LOT 492 LEASE
HAER No. PA-438

LOCATION: Clarendon vicinity, Warren County, Pennsylvania
UTM: 17.655022.4628781

DATE OF
CONSTRUCTION: ca. 1909

PRESENT OWNER: Allegheny National Forest

PRESENT USE: Abandoned

SIGNIFICANCE: Pennsylvania is the birthplace of the petroleum industry, signified by the drilling of Edwin Drake's well near Titusville in 1859. Many widely used techniques of drilling and pumping oil were first developed here in the effort to recover the high-quality "Pennsylvania Grade" oil. One particularly important, and successful, technique perfected in Pennsylvania was "central power" pumping of numerous low-production wells to economically recover small amounts of oil. This method of production flourished between ca. 1890 and ca. 1950, and today there are only scattered remains of this once common pumping technique. The South Penn Oil Company, G.M. Mead Lot 492 Lease is an excellent, rare, intact example of the mature, highly capitalized era of central powers. Furthermore, its octagon-shaped powerhouse is a refinement unique to northwestern Pennsylvania.

HISTORIAN: Michael W. Caplinger, 1997

PROJECT
INFORMATION: The Allegheny National Forest Oil Heritage Recording Project was undertaken during the summer of 1997 by the Historic American Engineering Record (HAER, Eric DeLony, Chief), a long range program to document historically significant engineering, industrial and maritime works in the United States. The program is part of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service, U.S. Department of the Interior. This project was sponsored by cooperative agreements between HABS/HAER, E. Blaine Cliver, Chief; the West Virginia University Institute for the History of Technology and Industrial Archaeology (IHTIA), Dr. Emory Kemp, Director; and Allegheny National Forest

(ANF), a unit of the Eastern Region of the U.S. Department of Agriculture (USDA) Forest Service, John Palmer, Supervisor. The Southwestern Pennsylvania Heritage Preservation Commission, Randy Cooley, Director, provided major funding.

The field work, measured drawings, historical reports and photographs were prepared under the general direction of Christopher Marston, HAER Project Leader, with consultation from Phil Ross, ANF Historian. The field team was led by Eric Elmer, HAER Field Architect Supervisor and Michael Caplinger, IHTIA Historian. The team included Arturs Lapins, US/ICOMOS Intern (Latvia); and IHITA delineators Paul Boxley, Scott Daley, Kara Hurst, and Kevin McClung. John T. Nicely produced the large format photography.

See also HAER No. PA-436, "Allegheny National Forest Oil Heritage," which provides a brief overview of the history of oil production in Pennsylvania and the history and operation of central power well-pumping systems.

INTRODUCTION

While petroleum sometimes would flow from a well under its own pressure, this was not usually the case. Most successful oil wells in Appalachia followed a pattern of high initial production (sometimes hundreds of barrels per day per well) followed by a rapid drop off to a few barrels per day--or week--or nothing at all. Thereafter, the well had to be mechanically pumped to recover any oil. By the 1870s, the "standard" pumping outfit was in use in Pennsylvania. Much of the surface equipment used to drill a well (the engine, bandwheel, and walking beam) could also be used to pump it. This was a one-engine-one-well system in which a steam-powered engine pumped a single well, termed "pumping on the beam."

After a well aged and production leveled off, it required pumping for only a short period, perhaps once or a few times a week.¹ In the decade following the establishment of Drake's well, there was little impetus for pumping low-production wells after their initial outflow, since new fields were continually being discovered and the drillers could simply move on to sink another well. There were exceptions, however, such as when the oil tapped by a well was of extremely high quality. With oil prices extremely low, though, it cost too much to outfit, maintain and equip an installation at each well. As prices began to stabilize in the 1880s, pumping became more feasible, and economization of the process became the key to profitability. This drive for efficiency resulted in the popularization of centrally powered multiple-well pumping systems, which were perfected in Pennsylvania's oil fields.

The essential components of a central power system were: the prime mover, or engine; a power reduction/motion-conversion/power distribution unit (always called the "power" in oil-field parlance, not to be confused with the engine or prime mover), which converted the engine's rotary motion to horizontal reciprocating motion; the shackle lines (also called pull, jerker or rod lines), which transmitted the reciprocating motion from the power out to the pump jacks; the pump jacks, which converted the horizontal reciprocating motion of the rod lines to vertical reciprocating motion; and finally, the sucker rods, which operated valves at the bottom of the well that pumped the oil to the surface. The engine and power required a substantial concrete foundation to resist the immense strains put on the machinery, and both were enclosed in a protective powerhouse. Powerhouses not only lessened the chance for fires, but also held spare parts and tools and gave the pumper and machinery protection from the elements. These equipment configurations were generally called central powers, but the term "jack plant" was also common. With the advent of gas and oil powered engines in the mid 1890s, costs were further lowered since the engine was powered by gas produced from the very wells it was pumping--a sort of low-cost perpetual pumping machine that required little manpower or maintenance to keep in operation. By about 1900, numerous oil-well supply companies had developed standardized systems that could be purchased in part or whole.

Certain factors controlled the use of central powers. Wells had to be relatively shallow, less than 3,000'. While up to forty shallow wells could theoretically be pumped by a well-balanced high-powered system, fifteen to twenty was a more common number. The wells had to be in relatively close proximity, within a mile. Although the shackle lines could be routed over and

¹ To increase production, a well could be "shot" or "torpedoed" with nitroglycerine to extensively fracture the oil sands at the bottom of the hole.

around difficult terrain, extreme topography could hinder their use and was sometimes better suited to individual wells pumping “on the beam.” While central power systems flourished between ca. 1880 and ca. 1950, the “unit pumper,” a self-contained pumping machine powered by a small gasoline engine or electric motor, succeeded them.

GEOLOGY

The South Penn Oil Company (which later became the Pennzoil Company, one of Pennsylvania’s leading petroleum producers) built the Mead lease pumping plant and operated it until ca. 1960.² This site is in the Morrison Run oil field, discovered in 1883, which produced from both the Glade sand and the Clarendon sand. The central power operated at least eleven wells in the immediate vicinity. These may have been drilled prior to 1909 and pumped by other means until this plant was built. At this site, the depth of the Glade sand averages 1,250’ and the Clarendon sand 1,390’, and each well produced an average of 1/2 barrel of petroleum per day.³ In the Glade sand, wells are spaced 200’ to 600’ apart. The Glade sand ranges from 1,000’ to 1,400’ in depth with a thickness of 24’ to 60’.⁴ The Clarendon sand is also called the “Tiona” or “Third” sand by drillers. It was usually shot with 75 to 175 quarts of nitroglycerine.⁵ Hydrofracturing has been undertaken in the field since 1960, and the field is still active.

MACHINERY AND THE POWERHOUSE

The prime mover is a Franklin valveless engine with double flywheels and an electronic spark-plug ignition.⁶ The clutch is also intact. Gas from a nearby well-head, which passed through a gasometer (located in the phone booth-sized gasometer house located just to the south of the building) to stabilize the pressure prior to being sent into the powerhouse, fired the engine. What appears to be a gas separator tank, perhaps associated with the Olin engine, sits in the northwest corner of the room. A thermal siphon system that circulated water from the riveted-steel cooling tank at the southern end of the room through the engine’s cylinder jacket cooled the engine, which sits on two steel I-beams that rest on a substantial, elevated concrete foundation. “SPO Co” (for South Penn Oil Company) is cast in relief on the southern side of the engine’s concrete foundation. A 1’-wide leather belt (still in place) connects the engine pulley to the “power” through a square opening in the engine-room wall.

The belt transferred the engine’s rotary motion to a belt pulley on a Titusville Iron Company bevel-gear power, with double overslung eccentrics. The power’s large, rectangular concrete base has “1909” painted on it. The power reduced the engine’s r.p.m. and imparted an 18” stroke to the eleven or so rod lines it pulled. Because of the two eccentrics, the rod lines exited the power room at two levels, piercing the tin walls through well-worn holes between framing beams. Both the Franklin engine and the Titusville Iron Company geared power were

² “G.M. Mead” was painted on the door. Mead was a local operator and held the oil lease on this property.

³ William Lytle, *Oil and Gas Geology of the Warren Quadrangle, Pennsylvania*, Pennsylvania Geological Survey Bulletin M 52 (Harrisburg: Commonwealth of Pennsylvania, 1965), p. 37.

⁴ *Ibid.*, p. 35.

⁵ *Ibid.*, p. 17.

⁶ This was probably a replacement for an earlier Olin engine.

manufactured locally. The shackle lines are 1" diameter steel rods supported by steel-pipe tripod pendulum hangers. The remaining pump jacks are direct-lift underpull units.

Visually and structurally, the powerhouse is divided into three parts. The southern portion of the powerhouse is a rectangular engine room, which consists of a simple wood-frame structure with a corrugated tin sheet exterior and roof. Flat tin sheeting finishes the engine room's interior ceiling and four walls, and the space is sectioned off from the remainder of the building to reduce the chance of accidental fire. A small gas stove and a gas light fixture provided heat and light. Two small, 2-over-2 pane windows also provide some illumination, as well as ventilation in the summer months. Doors pierce both the southern and northern walls. The southern door leads outside beneath a simple overhanging porch roof while the northern door leads to the beltway or "belt tunnel."

The belt tunnel is an elongated passage, with wood-framing, corrugated tin-sheet walls and roof and a concrete floor, connecting the engine room to the octagon power room. One small window in either wall provides light. The belt passes along the western side of the passage, while the eastern side is a walkway. There is a small, rectangular foundation/pedestal in the beltway that at one time supported an air-compressor used to charge a compressed-air reservoir bottle in the engine room. The compressed air was then used to crank the engine the next time it was started.

The octagon-shaped structures housing the Mead central power and the Lockwood central power (see HAER No. PA-439) are a regional variant of the standard rectangular powerhouses found in other oil fields. The Mead power octagon is a wood-frame structure with correlated tin sheet exterior and a conical, wood-shingle roof (one repaired section is correlated tin) created by eight identical triangles. As in the rest of the structure, the floor is concrete. Inside, the wood framing is exposed. Interestingly, the wall framing pattern exhibits the octagon shape as well. Heavier horizontal cross beams incorporated into the walls at the height of the rod lines helped resist the strains of the oscillating rods as they rubbed on the framing. Extra-heavy hewn timbers are used for the eight primary vertical members. Two small, rectangular doors pierce the octagon's walls, as do three small windows.

Octagon powerhouses were built in this part of Pennsylvania from around 1905 to around 1920, perhaps solely by the South Penn Company, and represent the highest aesthetic development of otherwise strictly utilitarian powerhouses. They were probably structurally superior as well, as the triangular frame layout appears inherently stronger, while providing for more floor space around the power than a rectangular building. Importantly, an octagon's low, conical roof efficiently shed both wind and snow coming from any direction, fighting the extreme weather conditions often found in northwestern Pennsylvania. The Mead Central Power's windswept, ridge top location was a logical site for such a specialized structure. The octagon's powers examined during this project's fieldwork are nearly identical, but each differs slightly in the framing layout, interior configurations and machinery. Local contractors specializing in pumping plant construction obtained construction materials locally and erected the buildings. The machinery was put in place first, then the building was erected around it.

One or two men who started the engine and pumped the wells two or three times a week probably maintained and operated this jack plant. A single pumping cycle usually lasted less than two hours. Each well likely produced less than three barrels of oil per week.

BIBLIOGRAPHY

Arnold, Ralph and William Kemnitzer. *Petroleum in the United States and Possessions*. New York: Harper Brothers Publishers, 1931.

Bacon, Raymond Foss and William Hamor. *The American Petroleum Industry*. Volume I. New York: The McGraw-Hill Book Company, 1916.

George, H.C. *Surface Machinery and Methods for Oil-Well Pumping*. Department of the Interior Bureau of Mines Bulletin 224. Washington, DC: Government Printing Office, 1925.

Lytle, William. *Oil and Gas Geology of the Warren Quadrangle, Pennsylvania*. Pennsylvania Geological Survey Bulletin M 52. Harrisburg: Commonwealth of Pennsylvania, 1965.